

Interview with Dr. Walter R. G. Baker by Mr. Frank Ernest Hill on Tuesday, 21 November, 1950, at 570 Lexington Avenue, New York City. This interview taken on tape-recorder.

I was born in Lockport, New York, on November 30th, 1892. I attended the grade schools and the high school there. My parents, at that time were in rather good circumstances. My father was a local merchant in a relatively small town - at that time around twelve thousand people.

In the early nineteen hundreds, when I was rather young, my father had serious financial reverses. As a result, we moved from Lockport, New York to Schenectady, New York. That was in 1907.

Up to that time I had very little interest in any study with a possible exception of physics. When I moved to Sch^enectady, I lost all contacts with the young people with whom I had been brought up. Coming into a strange town, and living near Union College, I formed a habit of going to the College library and reading almost anything that happened to attract my attention. Most of the books that I read were of a non-technical nature, in fact I don't remember reading any book of a technical nature.

After I had been in Schenectady a short time, my father obtained a job for me in what was then the Hudson River Telephone Company. It was before the Schenectady Telephone Company had been consolidated with the New York Telephone system.

It was purely a clerical job. As I remember it, the total work was to answer a telephone and take people's complaints. This was - so far as I was concerned - only a job. Except for the work I had done during summer vacations, either in my father's store or as a timekeeper on a transmission line which ran near Lockport, it was the only work that I had ever done. It was the only money that I had really earned.

The desk that I used at the Telephone Company was located in what was called in those days, the Wire Chief's Room. It was next to an instrument or piece of equipment called a test table. After I had taken the complaints from the telephone users, I would pass the card over to the men on this test table. They would make certain tests which would locate the trouble so that it could be fixed.

In watching these men on the test table, it seemed to me that I should be able to do that type of work. However, there was no opportunity to learn it. I remember that in one winter, the wire chief, who was responsible for all the technical operation in the exchange, started a course in fundamental electricity.

I took this course simply because all of the other men took it. I wasn't particularly interested in it. I wasn't interested in it primarily because it didn't tell me how to do the job that these men were working on at the test table.

I don't know how long I held that job. It wasn't very long before, in going down the street, I ran across a store which had an exhibit of the International Correspondence School. I noticed that one of the volumes exhibited was a course on Telephone and Telegraph engineering. The book showed pictures of the exact thing that I wanted to know - how to do these things on the test table.

In addition to the test table there were motor generators in this room where I was located and batteries and what was then called the main distributing frame, and many other things that were an entire mystery to me.

Well, to sum this up, I took the correspondence school course and for two years all my time, when I wasn't working, was devoted to that course. I really learned the telephone business through that study. It was a tremendous amount of work.

I entered Union College in 1912. I worked my way through and finished with honors. I earned my Sigma Xi key. Just as I was about to graduate, Hoxie, of whom I was a great admirer, left the telephone company and secured a position in the GE laboratories in Schenectady.

It was now perfectly obvious to me - having this much education - that I wanted to get more. I wanted to take my master's degree. But I still wanted to follow the Telephone business. It was the only thing that I knew, it was the only thing that attracted me. Every thesis that I wrote during my scholastic course was on the telephone business.

Ernst Berg, who was my professor of electrical engineering at Union, saw that I was inclined toward mathematical work and physics and he encouraged me greatly. They didn't teach the use of hyperbolic functions in Union at that time. But Berg, feeling I was determined to stay in the telephone business, encouraged me to study hyperbolic functions. I remember one of the theses I wrote was on hyperbolic functions, and on the loading of telephone cables and that sort of thing.

When I had finished college, I had two courses open to me. I could go with Hoxie at General Electric, who was working on talking motion pictures - which was of minor interest to me - or with the telephone company - which was then the New York Telephone Company. The telephone company offered me a job as assistant division engineer in Albany. While I liked the job all right, it seemed too routine. It was too simple a job, and it seemed to me it didn't offer any challenge to what I thought I could do if I got a chance.

The man who was general manager of the division at that time was a chap by the name of Cooper - who later became a Vice-President of the telephone company. Cooper and I became quite friendly and he saw that my leanings were not toward a routine engineering job. So he asked me to go to the Western Electric Company's Bell laboratories in New York, on West Street at that time. I went to New York met a lot of people and was quite attracted to the place. But by this time my mother and father were getting along in years and I was the only child at home.

I actually worked on the job as Assistant Division Engineer from the time I got out of college until early in 1917.

I had the choice to make as to whether to stay with the Bell Laboratories in New York and leave my mother and father, or go to the General Electric Company. Hoxie had been continuously after me to work for him in the GE laboratory. Finally I made the decision that I would stay in Schenectady, because my parents were there and also I wanted to do this because it would enable me to take my master's degree at Union College.

So I started working with Hoxie on what later became one of the basic principles used in talking motion pictures.

Actually at that time Hoxie was more interested in a high speed system of photographic telegraph reception that used a photographic tape on which the incoming signals were photographed. This tape then went through two or three long tubes of developers and fixing solutions and finally drying.. This machine was only to receive high speed telegraphy, it was not facsimile.

then was to develop a fifty watt transmitter for use aboard submarines, which we did. The jobs then came very rapidly for larger and larger transmitters and receivers and for methods of testing antennas. I took trips in submarines to test the product, took trips with the Atlantic fleet to test the transmitters and receivers that we had built and took many air trips in order to test our product on aircraft.

We knew so little about the antenna structure required on ships, submarines or aircraft that it was a continuous process of experimenting, trying to attain a result and then going back and trying to build a theory which fitted the result we had obtained.

Such experimentation lasted during the course of the entire war. I remember the only time when I almost left this type of work was when Langmuir tried to interest me in submarine detection. Having a start on the radio end of it, I didn't want to leave it so I didn't make the transfer.

There were, of course, miscellaneous jobs in between the radio jobs. I did quite a little work with einthoden ^{7. of} galvanometers. I also worked along a line which later turned out to be the cardiograph. We did some of the original work on this in the laboratory. But all of these were side issues, the main issue was on radio.

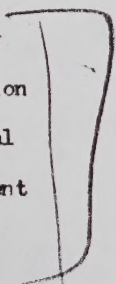
Then the war ended, and just about that time KDKA rather startled the world, at least it startled me, with a broadcast. We had been in effect broadcasting all the time in our telephone communications but it had never occurred to us that people might like to listen to broadcasts.

As soon as KDKA started to broadcast I wanted to build a broadcast transmitter for General Electric. I had very, very little support. I remember at that time the Vice President in charge of Engineering was F. C. Pratt. I tried hard to sell him on this idea and to get him to appropriate money to go ahead with a broadcast transmitter but he wouldn't do it. He didn't believe in it. I should say the majority of the people in the company then didn't believe in it.

Finally he agreed to give me the money if the transmitter could be used to handle telegraph transmission between the Schenectady, Pittsfield, Erie, Fort Wayne and Lynn works. I had no idea whether it would or not, but I had to take the chance in order to get the money, so I said it would handle it. We may have sent a few messages to Pittsfield but it was put into use almost at once for broadcasting purposes. That was the beginning of WGY. KDKA and our own transmitter were among the few on the air at that time.

That led to the building of a number of transmitters, all coming from this "bread ~~and~~ board" job which we developed in the laboratory, and finally ending up with the big fifty kilowatt WGY transmitter located in South Schenectady today.

As broadcasting developed, it was obvious that we needed a department, which built not only transmitters but receivers and other items that went into such an undertaking. About this time the status of the Alexanderson alternator came up. Out of the dealing with the Navy and the General Electric Company, there was formed the Radio Corporation of America whose job it was to sell the radio products built by General Electric and Westinghouse. General Electric was to build sixty per cent of the products and Westinghouse was to build forty per cent of them.



The American Marconi Company was taken over by the General Electric Company and Adam Stein, who headed up the American Marconi, was brought into the General Electric Company as Managing Engineer of the Radio Department. E. I. Edwards, associated with lighting department of GE was named the manager of the department. His job was wholly commercial, Stein's was the engineering and manufacturing.

Stein brought Van Dyke and several others with him. I had never cared particularly about receivers, but I was interested in transmitters, so Stein made me the designing engineer of the Transmitter Division of the Radio Department. He made Van Dyke the designing engineer of receivers.

Then we set up shop in Building Forty in Schenectady up on the third or fourth floor. We soon outgrew that and moved out into Building Seventy Seven. So far as I was concerned, we built a whole series of important broadcast stations. We built all the original stations used by RCA and many other big stations. (Five Kilowatt, Ten Kilowatt, Fifty Kilowatt and 500 Kilowatt.)

After we started this work, we began to replace the spark transmitters on board ships. I remember we built two hundred and fifty watt and one Kilowatt models for telephone, CW and ICW transmitter aboard ships.

It was then the United Fruit Company wanted us to build a twenty kilowatt transmitter for them. Up to that time the largest transmitter we had built was rated at one kilowatt. To jump from a one to a twenty kilowatt was a very sizeable undertaking. But we took the chance

and we built a number of twenty kilowatt transmitters for United Fruit, which were located in the Caribbean Sea area, New Orleans and Sea Island and all through Central America. These were for ship-to-shore communication, with the United Fruit ships. The ships had two hundred and fifty watt and one kilowatt sets.

While I did the designing of the transmitters, Van Dyke was working on receivers.

By this time the radio receiver business had become a tremendous one for those days. The tube business had also become large. Receiver tubes were made in the lamp department of General Electric and the lamp department of Westinghouse. Put the transmitter tubes were made in a small factory in Schenectady, which was really a part of the research laboratory. The work was directed by Bill White, although he was interested in development work, he did have the manufacturing of these tubes as a part of his responsibility. This progressed up to 1926 or 1927.

The receiver division of the Radio Department got into serious trouble with the product with the result there were several organizational changes and I was then given the responsibility for both receivers and transmitters and was named designing engineer of the department. We went along quite successfully until about '29. Then Adam Stein, who was the Managing Engineer of the Department, quit. I was given his job.

The first receiving sets built by the radio department back in 1921 was a little crystal set in which the tuning was done by the so called "loss method". In this type of tuning a copper plate of a particular -like form was rotated over a coil and you tuned it that way. It was a metal set.

Next we went into a series of metal boxes. We tuned now by a regular variable condenser. The tuning mechanism of these was in one box and the detector too. You could listen with ear phones. A little later you could buy another metal unit, a sort of block build-up, which added amplification - you still had to listen with earphones.

The next receiver was a regenerative circuit, but not a super-regenerative one. This was the straight regenerative circuit, which was about the first set that went into a wooden box, but there was little attention paid to the styling or anything else.

(About that time RCA made a deal whereby they secured Armstrong's superheterodyne circuit.) We then built our first superheterodyne set. I had nothing to do with it. That was the job that got the receiver fellows into trouble. It was a long box - about three feet long, twelve inches high and twelve inches deep - with a compartment for dry batteries. There still was no other power sources other than the dry batteries. This set also had a loud speaker as a separate product, it was a horn made out of the kind of material that you make battery boxes out of, - it was made by the battery box manufacturers. Located in the base of this horn was an

ordinary head phone. That was used with the first superheterodyne. I remember that you paid about two hundred and fifty dollars for this set including the loud speaker, the batteries and everything else. It wasn't the type of set that fitted into a living room very well. It was then I took over the receiver design as well as the transmitter design.

We refined the superheterodyne very materially. It was just at that time that any element of style at all began to creep into the cabinetry of the receivers. We secured a man from our own organization and started him on the styling job. He had no styling experience but he did have a flair for doing that type of work and was quite successful. We had bought our cabinets up to that time and experienced no end of trouble.

In the meantime RCA had inaugurated its license department. ~~They had been forced to do this because of action on the part of the Department of Justice.~~ So the receiver business became exceedingly competitive. We had only one outlet, RCA, and that's all Westinghouse had too - just one outlet.

Since RCA had to buy sixty percent of her products from us and forty per cent from Westinghouse, there was formed the Manufacturers' Design Committee, so that design would be such that they could be manufactured by either General Electric or Westinghouse. That was about 1927.

All during this time the radio business had been an exceedingly profitable one, not only for the two manufacturing companies but for RCA.

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~~As competition came in~~ more and more, it became a more difficult field to make money in.

The Manufacturers' Design Committee functioned this way. If I had a design, I would have to submit it to the Committee. This Committee, made up of engineers from both General Electric and Westinghouse, decided in effect what RCA would get. This didn't ride too well with RCA, but they agreed to it. Of course, there was much competition between the two manufacturing companies as to whose design was going to be used. Both did a great deal of design and development work.

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All this time, RCA had/been too happy under this arrangement. The old Victor Company was being increasingly hurt by the popularity of broadcasting. The first move of the Victor Company was when they came to RCA and asked to buy radio equipment.

There was a period there, perhaps a year or more, during which, we sold Victor chassis and they put them into their sets. I think they were then using the orthophonic system of reproduction.

We had marketed a dynamic loud speaker, which was a development of G. W. Rice and E. W. Kellogg. Those two fellows also brought out the magnetic pickup. In the meantime, our loud speaker situation was changing. We were using paper cones of various designs. Up to the time of the dynamic loud speaker, they were all driven by rather delicate mechanisms and a sort of armature action.

Rice brought a brand new idea in the dynamic speaker with reproduction which at that time was perfect.

Many things happened all of a sudden. We went to the AC tube, to converters and rectifiers so that we could convert from AC to DC, smooth it out, and use it on our tube anodes. We had had trickle chargers between the ordinary dry cells.

In 1929 it was possible to buy a piece of furniture with a dynamic loud speaker, a superheterodyne receiver and a record player, generally manual. At that time the multiple automatic record players were just beginning to be thought of.

We sold this equipment to the Victor Company. Then RCA made a deal with the Victor Company whereby there was a new company formed. I remember the name of that Company very distinctly, because it was the first company that I was ever on the board of directors. It was called the Audio Appliance Vision Company. It was a peculiar name and didn't mean very much. That company took over a part holding of the Victor Company. It was a stock deal, it held this stock and acted as the business liaison between the manufacturers and RCA and the Victor Company. It didn't last a year, because in 1929, I think it was, RCA bought out the Victor Company.

We then had a situation in which RCA was obligated to buy sixty-fourty-products from the General Electric and Westinghouse Companies. On the other hand, it was operating on its own a large manufacturing establishment skilled in the manufacture of phonographs and phonograph records and with a maximum distribution.

Then began a series of negotiations whereby RCA hoped to take over the manufacturing and ^{central} engineering functions of both General Electric and Westinghouse ^{on all radio activities except transmitters.} That deal was finally consummated, and the General Electric and Westinghouse were stripped of all their then radio activities except transmitters. There was written what was called the A-1 agreement. Under that A-1 agreement, General Electric was to refrain from going into any phase of the radio business. G.E. could do the engineering, if it wished, but it had no right to sell or manufacture for sale any radios or tubes, except for government work.

The Receiver engineering organization at Schenectady was transferred to Camden. The engineering organization of Westinghouse at Pittsburgh was also transferred to Camden. The Wireless specialty company, a little company controlled by General Electric since its purchase from United Fruit some years ago, was put into this deal. So through this deal, you had the original Victor Company, the Wireless Specialty Company, the General Electric Company and the Westinghouse Company. You had four different organizations whose radio interests had to be whipped into one. That took place in 1930. *

I went with the Victor Company as Vice President in charge of Engineering. My assistant was L. W. Chubb, who up to recently, has been director of the Research Laboratory of the Westinghouse Company. Chubb didn't stay in Camden very long. There was a very difficult situation down there, with all the different philosophies of the different groups.

At the time when the Radio Corporation of America itself was

* This period would not be complete without reference to the 1932 Consent Decree and the related A-1 Agreement. As a result, RCA became entirely independent of G.E. and Westinghouse. Other details are set forth in the 2nd volume of the Consent Decree proceedings.

formed, it was desired to organize a wholly American Company to deal with wireless in this country, and that was the reason for buying the American Marconi Company.

One of the men that I have been closely associated with in all of my experience with the General Electric Company in radio was Alexanderson. Alex wanted me to work for him several times, and drop my work in the laboratory and in the department, but I never felt as if I wanted to do that.

All during this time that I spoke of, I was taking correspondence school courses from Columbia University and Wisconsin University and a couple of others because I recognized my need of added education in certain lines. I had had no training in accounting, I had had no training in law, I had no training in industrial management, I had no training in marketing or in sales - in other words, I came out of school just a dyed-in-the-wool engineer. As I came into contact with other people over this period up to 1930, I would recognize the need of more education in these channels. That was one of the things that influenced me away from going with Alexanderson.

My contacts with Hull, Langmuir, White, John Payne and Saul Dushman were all on the level of the ideas one physicist exchanges with another.

There were many discussions with these people I mentioned. Alexanderson always gave a great deal in discussion, but he had such a brilliant mind that you could never follow him very closely. He would jump ten, fifteen or twenty steps in the development of an idea and come out with the result and leave you wondering how he got it. He was that type of an engineer. Somebody would always have to go back and do the hard, "blood, sweat and tears", work between the original discussion and

the end-result. But Alex would always jump over to the last page in the book and come out with the answer. I often wondered how he knew what the answer was, because so much of his work was almost instinctive.

I did a great deal of work with Alex in radio. We didn't always agree, but I had great respect for the man's natural intuition.

I never had much to do with Steinmetz. I always had the impression that he never thought very much of radio. He was fundamentally the power man and for a long, long time the people of General Electric thought that radio was just a gadget that wouldn't last very long. They thought that I was wasting my time fooling around with it, and that I should do other more important things. Then they began to be won over by this new thing.

Many of the people had a glimpse of what was coming. For instance, L. T. Robinson was a man from whom I had a great deal of support. And, Hoxie, always supported me, although he was not too much interested in radio. By this time - the late nineteen twenties and early thirties - he had become so wrapped up in the talking motion pictures that about all he wanted to do was to show me his accomplishments with the talking motion picture. He never seemed interested to see what I had been doing in radio.

Dushman was interested in tubes. I learned a lot from him. Langmuir, at one period, was very much interested in tubes. Particularly his work on the pliotron and the high-vacuum tube.

Hull was a great tube man. He probably did as much if not more than anyone else in the whole industry on tubes. He was a great help to me.

Bill White was a great help also, particularly on the circuit end of the business. While White was primarily interested in tubes, he was a good circuit man and many times he gave me a tremendous amount of assistance in the circuit end.

